DOCUMENT RESUME

ED 039 268 UD 0 943

AUTHOR Victor, Jack
TITLE An Exploration of Positional Response Sets in Disadvantaged Children and a Technique for Reduction of Such Sets. Final Report.
INSTITUTION New York Univ., N.Y. Inst. for Developmental Studies.
PUB DATE Dec 69
NOTE 37p.

EDRS PRICE EDRS Price MF-$0.25 HC Not Available from EDRS.
DESCRIPTORS Behavior Change, *Diagnostic Tests, *Disadvantaged Youth, *Early Childhood Education, Multiple Choice Tests, *Perceptual Development, Perceptually Handicapped, Preschool Programs, Reading Improvement, *Screening Tests
IDENTIFIERS Chinese Letter Naming Task

ABSTRACT

This study is concerned with an examination of tendencies among individuals or groups to vary in their selection of certain types of responses when the same choice is presented in some other form, the tendencies being termed "response sets." Positional response sets (PRS), to which multiple-choice type items are prone, have reportedly been relatively ignored in test construction and interpretation. The main results of this study showed that: (1) positional response set behavior occurs with great frequency among preschool disadvantaged children, and that this behavior is subject to modification by training; (2) characteristic group patterns emerge when scores are combined; (3) sex of subjects seem to have some effect on these patterns; (4) age seems to strongly influence the probability of occurrence of PRS in subjects; (5) utilization of a procedure in which subjects are given training in scanning arrays similar to the test arrays resulted in a significant alteration of guessing patterns in relation to the patterns of groups not similarly trained; and, (6) the effect of the training procedures on the choice patterns in the Chinese Letter Naming Task transferred to the situation utilizing the same array arrangements, but different stimuli. Implications of this study for preschool remedial programs are discussed. [Not available in hard copy due to marginal legibility of the original document.] (KG)

F-OEO
UD

OEO Contract No. B89-4612 (B)

Final Report, December, 1969

An Exploration of Positional Response Sets in Disadvantaged Children and a Technique for Reduction of Such Sets

Institute for Developmental Studies
School of Education
New York University
Director: Martin Deutsch, Ph.D.

Principal Investigator: Jack Victor, Ph.D.

ABSTRACT

Positional response sets (PRS), to which multiple-choice type items are prone, have been relatively ignored in test construction and interpretation. There is evidence indicating that children have strong PRS tendencies, though such sets may not play a strong role among adults. Evidence further suggests that PRS may indicate a lack of adequate scanning behavior.

The problems with which this study is concerned are as follows:

(1) Given two commonly used four-choice array arrangements administered to disadvantaged children, what are the positional response patterns for each of the arrays, when information is not available to the respondent?

(2) Do age and sex variables affect positional response tendencies in disadvantaged children?

(3) Can techniques be devised which can reduce the strength of the response sets?

One hundred twenty-eight Ss of preschool age and of low SES background were tested by means of an unsolvable multiple choice test, the Chinese Letter Naming Task. E subjects were given training in a technique designed to encourage scanning through entire arrays. E and C Ss were then retested either following training or, as in the case of the C group, following an interpolated task. Ss were then given a second "unsolvable" multiple choice task, that of recognizing flags of different nations.

The main results are: (1) positional response set behavior occurs with great frequency among preschool, disadvantaged children, and this behavior is subject to modification by training; (2) characteristic group patterns emerge when scores are combined; (3) sex of S seems to have some effect on the patterns obtained; (4) age seems to strongly influence the probability of occurence of PRS Ss; (5) utilization of a procedure in which Ss are given training in scanning arrays similar to the test arrays, resulted in significant alteration of guessing patterns in relation to the patterns of groups not similarly trained; and (6) the effect of the training procedures on choice patterns on the Chinese Letter Naming Task transfered to the situation utilizing the same array arrangements, but different stimuli (flags).

The facts that PRS occurs frequently among low SES, preschool children and that PRS may be caused by inadequate perusal of the stimulus field (thereby leading to a lack of registration of all the choices), have important implications for preschool programs,

especially in reference to prereading and test-taking skills. It is possible that low scores by these children on tests involving multiple choice may reflect, not so much a cognitive deficit, but, rather, an inadequate registration of the choices offered. If a child is not adequately registering information appearing on a page, reading cannot take place--perception must precede cognition. Given the problem outlined above, remedial steps can be taken and should be incorporated into preschool curricula.

BRIEF DESCRIPTION OF PROJECT

It is generally assumed that, when a group of respondents have no information concerning a set of multiple-choice questions, there is an equal probability that any of the "k" choices will be selected.

Many test constructors and evaluators, therefore, institute a correction for "guessing" formula under the assumption that, in any test, several items may be checked correctly by mere chance. Given "n" items and "k" choices for each of the "n" items, the number of correct guesses expected by chance is readily obtainable and may be taken into consideration in correcting the score for each respondent from the total number of correct responses.

There has been a great deal of literature in psychology and education dealing with "response sets"--tendencies among individuals or groups to select certain types of responses so that, if the choices were presented in some other form, a different response would have been selected.

However, much of this research concerns response sets for judgment categories in scaling problems, and little attention has been given to response sets in multiple-choice situations. Indeed, Cronbach (1946) claimed that the multiple-choice pattern is free from response sets.

A type of response set to which multiple-choice type items would be prone and that has been relatively ignored is positional response sets. While such response sets may not play a strong role in testing adults, we have found strong positional response set

tendencies over a variety of tests which we have been constructing, Early Childhood Inventories (ECI), for children of preschool age.

Such tendencies must play a strong role in the scoring and interpretation of tests for young children. This problem is most acute when tests are to be used diagnostically. If a teacher is interested in which colors a child does and does not know on a receptive level, the child is typically presented with arrays of size "k" and is asked to choose the color which the tester names. If positional response sets play a role, then those items whose correct choice is in a favored position will have a greater probability of being chosen than those items where the correct choice is in a less favorable position. Under such conditions, therefore, the question of which colors the child knows receptively cannot be adequately answered.

A child showing such positional response sets is very likely to be displaying a lack of adequate scanning behavior. Evidence to support this view is given in the finding that, on ECI protocols, response sets tend to occur often in young children. This finding suggests that their scanning is only partial and may be a function of lack of searching for the correct response. If children are given special experience in successful scanning, it may be possible to reduce the positional sets, thus providing truer measures of the child's ability.

The problems with which this project is concerned are as follows:

(1) Given two commonly used four-choice array arrangements administered to disadvantaged children, what are the positional

response set patterns for each of the arrays, when information is not available to the respondent?

(2) Do age and sex variables affect positional response tendencies in disadvantaged children?

(3) Can techniques be devised which can reduce the strength of the response sets?

By determining the positional response set behavior of young children, test constructors will be in a position to construct more valid instruments or test procedures (e.g., most of the Early Childhood Inventories consist of two similar forms, both of which are administered to young children who are prone to positional response set behavior). A technique which can be used to reduce response sets by creating appropriate scanning behavior would result in more valid data. This, in turn, would enable educators to more effectively diagnose the child's ability and plan remedial curricula.

It is suggested here that positional response sets may be caused by inadequate perusal of the stimulus field, thereby leading to a lack of registration of all the choices. The technique utilized here combines three types of instructional aids:

(1) verbally telling the subject to look at all positions;

(2) guiding the child to look at the arrays in a consistent and systematic manner and in such a way to be consonant with the development of appropriate English language reading skills (left to right, or left to right and then down to the next line and left to right);

(3) through the training series, showing the child that a correct answer can occur in more than one position.

METHODOLOGY

Subjects

One hundred twenty-eight subjects were utilized. Sixty-four of these subjects served as subjects in the linear array condition and the other 64 served as subjects in the quadrant condition. Half of the linear and half of the quadrant subjects were given the experimental treatment. The remaining subjects acted as controls. Half of the experimental subjects in each array condition were male, as were half of the control subjects in each array condition. The children ranged in age from 4-6 years.[1] All subjects were of low SES.

Materials and Procedure

Pretest

All subjects were exposed to 24 four-choice Chinese Letter Naming Task items.[2] For the linear array, the letters were arranged, each choice in a box, with the choices appearing in a left-right linear arrangement. For the quadrant array Ss, the four choices were arranged, also each in a box, but in a quadrant arrangement (each box appearing toward one of the four corners of the page). The letters were drawn on wallboard with magic marker. All the

---

1 Since birth dates of the Ss were difficult to obtain beforehand, age groupings were determined later. For the linear array Ss, 17 Es were in the younger age group and 15 in the older group. Half the linear Cs were in the older group and half in the younger group. For the quadrant arrays 14, Es belonged to the older group and only 11 Cs; while 18 Es and 21 Cs were in the younger age group.

2 Thirty-two of the letters were chosen from pilot-testing which indicated that Ss, from the same background as those used in the experiment, neither favored nor avoided those particular letters (Victor, 1968). The remaining letters consisted of some of the 32 letters placed upside down.

boxes were equal in size, and the size of the letters were also approximately equal. Items were presented to S by having E expose the boards, one by one, as if turning the pages of a booklet. The children were asked to look at the four choices and select the one which they thought was the "real" Chinese letter.[3]

Training

Experimental:

Experimental subjects were shown four-choice arrays of 16 sets of pictures and symbols. Twelve of these were readily identifiable and easy to discriminate for the age group involved. The remaining four were difficult for the age group in order to produce a few errors and make a second trial logical. In trial one, subjects were shown the pictures exposed through a sliding window, containing four openings, which E slid across the page in the linear array, exposing one picture, then two, then three and then all four in a left-right sequence. For the quadrant array, two sliding windows were used, each having two openings. They were placed across the quadrant arrays, one above and parallel to the other. First, the top-left window was exposed by E and then the top-right. Finally, the bottom windows were exposed to show the remaining two pictures. Hence, both exposure sequences resembled adult reading patterns (left to right, or top-left to right and then bottom-left to right). E also instructed S in both procedures to look at all of the pictures before choosing one.

[3] It was necessary to utilize an unsolvable task because we were interested in a guessing pattern.

Control:

Control subjects were shown single pictures and asked to name them. The single pictures were the critical items from the experimental training procedure. Again two trials were used.

Posttest

Exactly the same as Pretest.

Transfer

In order to see whether the changes that occurred in the response patterns for the Chinese Letter Naming Task would be maintained in a different situation, a second task was presented. Arrays of flags of different countries were presented in the same manner as the posttest. The child's task was to choose the flag which E named. Again, knowledge could not have been a factor with children of this age and background. Sets were arranged to provide maximal similarity between the flags used in any single array and care was taken to avoid placing any single flag which stood out from any of the others in its array.

FINDINGS

Tables 1 and 2 show the distribution of choices among the four positions for each subject on the pretest. Subjects whose choice pattern reveals a distribution of choices which deviates significantly from chance by x^2 test (d.f. = 3) are indicated by asterisks.

Inspection of Table 1 indicates that 14 E and 12 C subjects did not respond randomly. Hence, almost half the group tested evidenced positional response set behavior when linearly arranged patterns of four choices were presented and when knowledge was not a factor.

Table 2 shows 18 E and 16 C subjects evidencing positional response set behavior. This proportion represents more than half of the group tested with four-choice items arranged in quadrants when knowledge was not a factor.

Tables 3 and 4 show the distribution of choices among the four positions for each subject on the posttest.

Inspection of Table 3 shows 11 E and 14 C subjects with significant positional response sets. Therefore, compared to the pretest, three less E subjects and two more C subjects showed significant positional response sets following training.

Table 4 indicates 10 E and 15 C subjects showing significant positional response set behavior. Therefore, compared to the pretest, eight less E and only one less C subject showed significant positional response set behavior following training.

TABLE 1

Pretest: x^2 and Frequency Distribution of Choices for Linear E (Experimental) and C (Control) Subjects for Each Position

	E					C			
Subject	a	b	c	d	Subject	a	b	c	d
1	* 16	0	3	5	1	9	3	7	5
2	2	8	8	6	2	* 17	2	2	3
3	* 1	3	13	7	3	* 10	4	1	9
4	2	8	10	4	4	11	5	3	5
5	* 24	0	0	0	5	4	7	4	9
6	10	6	6	2	6	* 3	2	9	10
7	* 14	8	2	0	7	6	6	7	5
8	4	3	11	6	8	6	9	7	2
9	* 8	16	0	0	9	* 0	24	0	0
10	* 0	1	23	0	10	5	7	4	8
11	* 12	4	4	4	11	7	1	8	8
12	6	5	7	6	12	7	4	7	6
13	* 0	1	23	0	13	* 2	5	12	5
14	6	8	4	6	14	5	9	3	7
15	9	5	3	7	15	* 12	5	4	3
16	5	11	3	5	16	9	3	7	5
17	7	6	8	3	17	* 5	11	7	1
18	3	9	6	6	18	4	4	9	7
19	* 18	3	2	1	19	5	4	7	8
20	* 11	9	2	2	20	7	4	4	9
21	* 1	18	5	0	21	* 0	0	0	24
22	* 2	10	11	1	22	* 0	1	21	2
23	5	7	7	5	23	10	8	5	1
24	7	5	8	4	24	* 14	5	2	3
25	2	5	11	6	25	6	7	7	4
26	7	8	5	4	26	* 0	22	2	0
27	* 4	12	5	3	27	9	5	3	7
28	4	7	8	5	28	2	9	7	6
29	7	8	6	3	29	2	5	6	11
30	5	5	4	10	30	* 0	1	23	0
31	3	7	10	4	31	3	5	11	5
32	* 0	4	17	3	32	4	11	4	5

* $x^2 > 7.82$, $p < .05$

TABLE 2

Pretest: x^2 and Frequency Distribution of Choices for Quadrant E (Experimental) and C (Control) Subjects for Each Position

	E					C			
Subject	a	b	c	d	Subject	a	b	c	d
1	7	8	5	4	1	* 3	13	1	7
2	* 0	24	0	0	2	4	8	5	7
3	* 0	0	8	16	3	* 19	3	2	0
4	* 4	1	11	8	4	7	3	4	10
5	10	6	2	6	5	8	6	3	7
6	6	6	8	4	6	* 3	12	0	9
7	* 2	21	1	0	7	8	4	6	6
8	6	5	8	5	8	* 0	3	2	19
9	* 0	0	0	24	9	9	5	3	7
10	5	6	6	7	10	* 2	10	3	9
11	* 4	13	2	5	11	4	6	4	10
12	* 0	17	0	7	12	* 2	1	12	9
13	2	5	7	10	13	* 16	8	0	0
14	* 1	3	2	18	14	6	7	6	5
15	* 8	1	15	0	15	* 9	10	3	2
16	4	6	5	9	16	7	6	4	7
17	3	6	8	7	17	* 6	4	14	0
18	4	3	9	8	18	* 0	24	0	0
19	* 0	0	22	2	19	* 9	14	0	1
20	* 1	0	13	10	20	5	3	6	10
21	8	9	2	5	21	5	8	6	5
22	3	7	4	10	22	5	6	6	7
23	* 4	2	13	5	23	7	4	6	7
24	6	6	5	7	24	6	5	6	7
25	* 0	0	24	0	25	5	6	6	7
26	6	3	5	10	26	* 4	0	13	7
27	* 3	0	12	9	27	* 2	2	6	14
28	* 4	4	1	15	28	* 0	0	24	0
29	1	10	8	5	29	4	7	9	4
30	* 1	11	5	7	30	* 5	2	16	1
31	*12	5	6	1	31	6	5	7	6
32	* 0	23	0	1	32	* 0	0	24	0

* $x^2 > 7.82$, $p < .05$

TABLE 3

Posttest: x^2 and Frequency Distribution of Choices for Linear E (Experimental) and C (Control) Subjects for Each Position

E						C					
Subject		a	b	c	d	Subject		a	b	c	d
1	*	6	6	12	0	1		7	5	6	6
2		1	6	8	9	2	*	15	6	3	0
3	*	2	8	8	6	3	*	10	6	5	3
4		5	6	5	8	4		12	3	5	4
5	*	24	0	0	0	5		12	8	2	2
6		8	10	6	0	6	*	2	12	9	1
7	*	23	1	0	0	7		7	8	6	3
8		7	6	7	4	8		3	8	9	4
9	*	6	7	7	4	9	*	0	24	0	0
10	*	0	2	22	0	10		3	9	4	8
11	*	2	7	5	10	11		8	5	6	5
12		8	6	4	6	12		8	4	8	4
13	*	0	0	24	0	13	*	1	7	9	7
14		1	6	15	2	14		6	7	2	9
15		14	3	2	5	15	*	10	3	6	5
16		4	7	3	10	16		22	1	1	0
17		9	6	3	6	17	*	11	6	5	2
18		3	11	5	5	18		3	6	8	7
19	*	10	12	2	0	19		5	9	5	5
20	*	6	10	5	3	20		6	5	6	7
21	*	1	12	8	3	21	*	0	0	0	24
22	*	4	10	7	3	22	*	2	14	8	0
23		6	4	9	5	23		11	5	6	2
24		5	7	8	4	24	*	9	7	8	0
25		3	7	8	6	25		5	5	7	7
26		8	4	6	6	26	*	0	24	0	0
27	*	5	7	6	6	27		14	6	1	3
28		7	7	4	6	28		3	7	8	6
29		4	14	4	2	29		1	4	13	6
30		10	5	7	2	30	*	0	6	13	5
31		5	3	10	6	31		10	8	3	3
32	*	6	9	6	3	32		0	7	9	8

* $x^2 > 7.82$, $p < .05$

TABLE 4

Posttest: x^2 and Frequency Distribution of Choices for Quadrant E (Experimental) and C (Control) Subjects for Each Position

E						C					
Subject		a	b	c	d	Subject		a	b	c	d
1		8	7	3	6	1	*	6	5	2	11
2	*	5	9	4	6	2		10	4	5	5
3	*	5	12	0	7	3	*	15	0	9	0
4	*	6	3	7	8	4		1	3	6	14
5		7	4	5	8	5		11	4	8	1
6		7	7	6	4	6	*	8	8	2	6
7	*	6	14	4	0	7		6	7	5	6
8		6	6	5	7	8	*	2	5	3	14
9	*	4	3	9	8	9		7	6	3	8
10		8	4	1	11	10	*	7	5	4	8
11	*	8	7	5	4	11		6	4	6	8
12	*	0	14	0	10	12	*	2	1	9	12
13		4	6	6	8	13	*	8	16	0	0
14	*	9	7	5	3	14		8	5	8	3
15	*	0	0	24	0	15	*	8	4	7	5
16		8	5	7	4	16		7	6	5	6
17		5	5	8	6	17	*	4	13	7	0
18		4	8	6	6	18	*	0	24	0	0
19	*	4	17	1	2	19	*	10	9	3	2
20	*	4	0	14	6	20		6	4	9	5
21		8	7	5	4	21		4	6	5	9
22		5	3	6	10	22		2	5	9	8
23	*	6	5	8	5	23		10	7	5	2
24		5	5	11	3	24		3	11	5	5
25	*	8	2	11	3	25		7	8	3	6
26		10	7	4	3	26	*	0	0	14	10
27	*	9	2	9	4	27	*	12	0	7	5
28	*	3	6	5	10	28	*	0	0	24	0
29		4	8	4	8	29		12	0	7	5
30	*	5	2	6	11	30	*	0	0	24	0
31	*	13	5	6	0	31		6	5	7	6
32	*	0	24	0	0	32	*	0	0	24	0

* $x^2 > 7.82$, $p < .05$

TABLE 5

Transfer Test: x^2 and Frequency Distribution of Choices for Linear E (Experimental) and C (Control) Subjects for Each Position

E					C				
Subject	a	b	c	d	Subject	a	b	c	d
1 *	5	5	7	7	1	5	6	10	3
2	0	4	7	13	2 *	21	1	0	2
3 *	7	3	3	11	3 *	8	7	5	4
4	9	2	6	7	4	4	10	5	5
5 *	21	0	1	2	5	3	15	2	4
6	0	1	0	23	6 *	1	5	9	9
7 *	3	6	11	4	7	11	5	5	3
8	0	0	14	10	8	5	11	7	1
9 *	4	7	4	9	9 *	0	24	0	0
10 *	0	0	23	1	10	4	9	5	6
11 *	2	12	4	6	11	8	4	5	7
12	10	3	5	6	12	3	11	7	3
13 *	0	0	24	0	13 *	7	3	9	5
14	7	8	4	5	14	8	8	2	6
15	8	13	1	2	15 *	9	8	4	3
16	11	5	5	3	16	7	2	7	8
17	5	2	9	8	17 *	9	13	1	1
18	7	6	9	2	18	5	2	7	10
19 *	1	12	11	0	19	6	9	8	1
20 *	3	13	6	2	20	2	4	10	8
21 *	3	10	6	5	21 *	0	0	0	24
22 *	3	14	6	1	22 *	1	0	21	2
23	5	6	8	5	23	5	6	7	6
24	4	4	12	4	24 *	2	6	12	4
25	4	6	6	8	25	3	5	9	7
26	1	7	7	9	26 *	0	24	0	0
27 *	4	8	4	8	27	13	5	4	2
28	4	4	7	9	28	2	6	13	3
29	8	12	2	2	29	9	3	4	8
30	4	6	10	4	30 *	0	2	18	4
31	7	6	7	4	31	7	7	9	1
32 *	2	7	10	5	32	1	6	11	6

* $x^2 > 7.82$, $p < .05$

TABLE 6

Transfer Test: x^2 and Frequency Distribution of Choices for Quadrant E (Experimental) and C (Control) Subjects for Each Position

E						C					
Subject		a	b	c	d	Subject		a	b	c	d
1		8	5	6	5	1	*	0	21	0	3
2	*	7	6	5	6	2		5	3	11	5
3	*	5	11	0	8	3	*	7	4	9	4
4	*	11	5	5	3	4		6	1	8	9
5		11	1	8	4	5		11	7	4	2
6		6	6	6	6	6	*	2	11	0	11
7	*	0	21	0	3	7		6	5	6	7
8		6	6	7	5	8	*	5	5	5	9
9	*	0	11	3	10	9		5	8	2	9
10		4	7	6	7	10	*	6	4	4	10
11	*	8	12	2	2	11		4	8	6	6
12	*	14	5	3	2	12	*	2	0	17	5
13		13	4	3	4	13	*	24	0	0	0
14	*	4	5	11	4	14		4	3	4	13
15	*	9	3	7	5	15	*	2	5	9	8
16		4	8	6	6	16		7	5	8	4
17		5	3	9	7	17	*	12	6	1	5
18		7	6	5	6	18	*	2	22	0	0
19	*	10	3	7	4	19	*	2	2	1	19
20	*	2	1	15	6	20		7	4	7	6
21		8	10	2	4	21		7	9	3	5
22		4	11	4	5	22		10	3	8	3
23	*	9	6	5	4	23		8	4	8	4
24		4	4	7	9	24		5	5	5	9
25	*	2	1	9	12	25		7	5	4	8
26		9	3	7	5	26	*	2	4	14	4
27	*	7	5	7	5	27	*	2	3	9	10
28	*	5	5	6	8	28	*	0	0	24	0
29		10	2	10	2	29		2	5	1	16
30	*	2	4	6	12	30	*	5	8	2	9
31	*	23	1	0	0	31		7	4	4	9
32	*	3	17	0	4	32	*	0	0	8	16

* $x^2 > 7.82$, $p < .05$

TABLE 7

Pretest: x^2, Number and Percent Responses per Position for All Ss and for Ss with Significant Pretest Positional Response Sets Only

	Position A	Position B	Position C	Position D	x^2	p
Linear:						
All Ss (N=64)	389 (25%)	408 (27%)	438 (29%)	301 (20%)	27.10	$<.001$
PRS Ss (N=26)	174 (28%)	171 (27%)	193 (31%)	86 (14%)	43.71	$<.001$
Quadrant:						
All Ss (N=64)	291 (19%)	406 (26%)	424 (28%)	415 (27%)	30.45	$<.001$
PRS Ss (N=34)	124 (15%)	231 (28%)	255 (31%)	206 (25%)	47.71	$<.001$

Tables 5 and 6 show the distribution of choices among the four positions for each subject on the transfer test.

Table 5 shows that 14 E and 14 C subjects had significant positional response sets. This finding shows no gain for the E group from performance on the pretest. However, two more C subjects than on the pretest had significant positional response sets.

Inspection of Table 6 indicates that 13 E and 13 C subjects showed significant positional response sets. Improvement from pretest performance is therefore present in both groups. Five less E and three less C subjects showed significant sets than on the pretest.

Table 7 shows the x^2, distribution and percent responses per position on the pretest for E and C subjects combined. E and C subjects are combined here due to the fact that, since E and C treatments had not as yet been administered, treatment group was not considered a significant variable for analysis here. Also included are scores for subjects who showed significant positional response sets (PRS Ss).

Both the linear and quadrant subjects evidenced significant positional response sets as groups. For the linear arrays the set seems to be characterized by a strong avoidance of the last position. The quadrant arrays are yielded a group set of similar magnitude characterized by avoidance of the first or top left position. Regarding the PRS Ss alone, the same pattern is evidenced but emphasized for both array arrangements. In addition to these Ss, there seems to be a preference for the third position of the

linear array and for the third, or bottom left, position of the quadrant array.

Table 8 shows the x^2, distribution and percent responses per position on the pretest for E and C subjects considered by sex. In the linear condition while male subjects could be characterized by having a group positional set female subjects could not be so characterized. A larger proportion of males (15 of 32) than females (11 of 32) evidenced significant sets. However, seven female PRS Ss did not exhibit a characteristic group effect, but rather exhibited more idiosyncratic behavior. In the quadrant condition, both males and females exhibited an avoidance of the top left position. However, while males favored the bottom right position, females favored the bottom left position. Both male and female trends were exaggerated when considering the PRS Ss alone. In the case of the male Ss the group patterns seem to indicate a favoring, then, of the right hand choices.

Table 9 shows the x^2, distribution and percent responses per position on the pretest for E and C subjects considered by age. All groups showed significant sets except the older Ss on the linear array. In this case when PRS Ss are considered alone there is a significant set characterized by a favoring of the first and third positions in relation to the other two positions. The younger subjects show a strong avoidance for the fourth position and seem to favor the middle positions (second and third) in relation to the end positions (first and fourth). In the quadrant array, the older subjects showed a strong preference for the bottom right

TABLE 8

Pretest: x^2, Number and Percent Responses per Position by Sex, for All Ss and for Ss with Significant Pretest Positional Response Sets Only

	Position A	Position B	Position C	Position D	x^2	p
Linear:						
All M (N=32)	210 (27%)	204 (27%)	227 (30%)	127 (17%)	30.83	$<.001$
All F (N=32)	179 (23%)	204 (27%)	211 (27%)	174 (23%)	5.20	NS
PRS M (N=15)	105 (29%)	111 (31%)	120 (33%)	24 (7%)	56.80	$<.001$
PRS F (N=11)	69 (26%)	60 (23%)	73 (28%)	62 (23%)	1.67	NS
Quadrant:						
All M (N=32)	147 (19%)	212 (28%)	158 (21%)	251 (33%)	36.78	$<.001$
All F (N=32)	144 (19%)	194 (25%)	266 (35%)	164 (21%)	45.87	$<.001$
PRS M (N=16)	57 (15%)	128 (33%)	69 (18%)	130 (34%)	46.14	$<.001$
PRS F (N=18)	67 (16%)	103 (24%)	186 (43%)	76 (18%)	81.60	$<.001$

TABLE 9

Pretest: x^2, Number and Percent Responses per Position by Age Group, for All Ss and for Ss with Significant Pretest Positional Response Sets Only

	Position A	Position B	Position C	Position D	x^2	p
Linear:						
All 66 + (N=31)	187 (25%)	190 (26%)	206 (28%)	161 (22%)	5.61	NS
All 65 - (N=33)	202 (25%)	218 (27%)	232 (29%)	150 (19%)	19.58	$<.001$
PRS 66 + (N= 9)	64 (30%)	45 (21%)	66 (31%)	41 (19%)	9.15	$<.05$
PRS 66 - (N=17)	110 (27%)	126 (31%)	127 (31%)	45 (11%)	44.26	$<.001$
Quadrant:						
All 66 + (N=25)	122 (20%)	134 (22%)	130 (22%)	214 (36%)	36.92	$<.001$
All 65 - (N=39)	169 (18%)	272 (29%)	294 (31%)	201 (21%)	43.41	$<.001$
PRS 66 + (N= 9)	35 (16%)	39 (18%)	45 (21%)	97 (45%)	46.60	$<.001$
PRS 65 - (N=25)	89 (15%)	192 (32%)	210 (35%)	109 (18%)	71.78	$<.001$

position while the younger subjects acted quite differently, showing a strong preference for the bottom left position and a strong a...'ance for the top left position.

Table 10 shows the x^2, distribution and percent responses per position on the pretest for E and C subjects considered by sex and age group. In the linear array, it is clearly shown that the sex effect shown in Table 8 is not a function of interaction with age. Neither female group exhibits a group PRS. The younger males show a much stronger group effect than do the older males. In the quadrant array condition only the older females show no group PRS, hence the fact that on Table 9 older S groups showed a significant set seems to be primarily a function of the older males. Interestingly, it is the younger females who show much more marked positional set than the younger males. The patterns for the four groups were all quite different, the older females as mentioned before had no group effect; the older males seemed to favor the bottom right position and avoid the top left position; the younger males showed a strong preference for the top right position; the younger females showed an avoidance of the top left position similar to that of the older males and a preference for the bottom left position, a trend not characteristic of any other group.

Table 11 shows the means and S.D.'s by treatment, array arrangement and test period. Deviation scores are obtained by the following formula: $\Sigma(O-E)$, where O = the obtained frequency of responses for any position; and E = the expected frequency of responses for any position; since there are always four positions and 24 for test items, E was always equal to 4. The use of these deviation scores

TABLE 10

Pretest: x^2, Number and Percent Responses per Position by Sex and Age Group for All Ss[4]

	Position A	Position B	Position C	Position D	x^2	p
Linear:						
M 66 + (N=13)	93 (30%)	82 (26%)	84 (27%)	53 (17%)	11.69	$<.01$
M 65 - (N=19)	117 (26%)	122 (27%)	143 (31%)	74 (16%)	22.06	$<.001$
F 66 + (N=18)	94 (22%)	108 (25%)	122 (28%)	108 (25%)	3.62	NS
F 65 - (N=14)	85 (25%)	96 (29%)	89 (26%)	66 (20%)	4.31	NS
Quadrant:						
M 66 + (N=14)	48 (14%)	69 (21%)	71 (23%)	142 (42%)	58.74	$<.001$
M 65 - (N=18)	99 (23%)	143 (33%)	81 (19%)	109 (25%)	18.85	$<.001$
F 66 + (N=11)	74 (28%)	65 (25%)	53 (20%)	72 (27%)	4.18	NS
F 65 - (N=21)	70 (14%)	129 (26%)	213 (42%)	92 (18%)	94.20	$<.001$

4 Distributions for Ss with significant positional response sets only are not included in this table because of the small Ns involved.

enabled us to express the amount of PRS behavior quantitatively.

In Table 11, we note that, on the pretest, the average deviation score (DS) for each group, with the exception of the E quadrant group, was between 13 and 14. The EQ group obtained a mean DS of 16.12. On both the post and the transfer tests, both E groups obtained lower mean scores than their respective C groups.

These scores were tested for significance by a three-way analysis of variance (Treatment x Array Arrangement x Test Period). The hypothesis tested was that the interaction between treatment and test period should be significant in that while the E and C groups should be equal at pretest, the E group scores should drop significantly on the post and transfer tests. The only significant effect obtained was the above interaction. From Table 11 we see that the significant interaction occurred as predicted. On the pretest, the E scores were generally lower than the C scores, while on the post and transfer tests, the opposite was true.

Table 13 shows the means and S.D.'s of deviation scores by treatment, sex and test period.

Scores were tested to see whether sex, either alone or in interaction with treatment and/or test period had a significant effect on the results (Table 14). Again, the only significant effect was the treatment x test period interaction.

Table 15 presents the means and S.D.'s of the deviation scores by treatment, age group, and test period. The Ss were divided into two groups within each treatment condition as to whether they were 66 months of age and above or 65 months of age and below.

TABLE 11

Means and Standard Deviations
of Deviation Scores by Treatment, Array
Arrangement and Test Period (n = 32)

	Pretest		Posttest		Transfer	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
E Linear	13.81	9.32	12.09	10.38	13.50	9.17
E Quadrant	16.12	10.50	11.12	8.32	11.06	8.29
C Linear	13.34	9.79	13.06	9.59	14.12	9.38
C Quadrant	13.59	10.46	14.00	10.40	13.88	9.32

TABLE 12

Three-Way Analysis of Variance with
Repeated Measures of Deviation Scores
(Treatment x Array Arrangement x Test Period)

Source	SS	df	MS	F	p
Between Ss		127			
A (Treatment)	48.88	1	48.88	<1	
B (Array Arrangement)	.06	1	.06	<1	
AB	11.00	1	11.00	<1	
Ss within groups	25648.18	124	206.84		
Within Ss		383			
C (Test Period)	179.41	2	89.70	2.81	
AC	235.85	2	117.92	3.69	<.05
BC	110.24	2	55.12	1.73	
ABC.	71.65	2	35.82	1.12	
CxSs within groups	7918.85	248	31.93		

TABLE 13

Means and Standard Deviations of Deviation Scores by Treatment, Sex and Test Period (n = 32)

	Pretest		Posttest		Transfer	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
E Males	15.19	9.95	12.69	8.89	13.50	9.30
E Females	14.75	10.03	10.53	9.08	11.06	7.84
C Males	13.69	10.43	13.44	9.71	13.25	9.07
C Females	13.25	9.65	13.63	10.15	14.75	9.57

TABLE 14

Three-Way Analysis of Variance with
Repeated Measures of Deviation Scores
(Treatment x Sex x Test Period)

Source	SS	df	MS	F	p
Between Ss		127			
A (Treatment)	48.88	1	48.88	<1	
B (Sex)	38.13	1	38.13	<1	
AB	105.20	1	105.20	<1	
Ss within groups	25515.91	124	205.77	<1	
Within Ss		256			
C (Test Period)	179.41	2	89.70	2.77	
AC	235.85	2	117.92	3.64	$<.05$
BC	6.03	2	3.02	<1	
ABC	62.78	2	31.39	<1	
CxSs within groups	8031.93	248	32.39		

TABLE 15

Ns, Means and Standard Deviations of Deviation Scores by Treatment, Age Group and Test Period

			Pretest		Posttest		Transfer	
		n	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
E	66+	29	12.48	9.76	11.69	9.44	10.69	7.37
E	65-	35	17.03	9.69	11.54	8.89	13.60	9.43
C	66+	27	11.96	10.15	11.33	8.54	12.74	9.80
C	65-	37	14.57	9.97	15.14	10.67	14.92	8.90

Table 16 shows the analysis of variance calculated to ascertain whether age, either singly or in interaction with treatment and/or test period, was a significant factor. Again, only the treatment x test period interaction reached an acceptable ($p < .05$) level of significance. The main effect of age did not quite reach this level.

TABLE 16

Three-Way Analysis of Variance with
Repeated Measures of Deviation Scores
(Treatment x Age Group x Test Period)

Source	SS	df	MS	F	p
Between Ss		127			
A (Treatment)	34.74	1	34.74	<1	
B (Age)	666.02	1	666.02	3.06	
AB	.14	1	.14	<1	
Ss within groups	26993.93	124	217.69		
Within Ss		256			
C (Test Period)	162.95	2	81.48	2.56	
AC	207.80	2	103.90	3.27	<.05
BC	48.95	2	24.47	<1	
ABC	153.48	2	76.74	2.41	
CxSs within groups	7898.10	248	31.85		

CONCLUSIONS

1. This research has shown that positional response set behavior occurs with great frequency among preschool age, disadvantaged children, and that this behavior is subject to modification by training.

Of the Ss tested, 40% of those exposed to linear (left to right) arrays exhibited PRS behavior, while over 50% of those exposed to quadrant arrays showed PRS tendencies.

2. When scores are combined, it can be seen that characteristic group patterns emerge. When exposed to linear arrays, PRS is characterized by a relative avoidance of the fourth or right-hand most position. When the stimuli are arranged in quadrant patterns, group avoidance is shown for the first or upper-left position.

Considering only PRS Ss, we may also conclude that, with linear arrays, there is a preference for the third position. With quadrant arrays, preference is also for the third, but in this case bottom-left, position.

3. Sex of the subject appeared to have some effect on the patterns obtained. With linear arrays, while males reflected the trend cited in (2), females were quite idiosyncratic and did not display a distinctive group pattern. With quadrant arrays, both males and females displayed the characteristic avoidance of the top-left position, but preferences differed. Males tended to choose positions on the right, whether upper or lower, while females showed a strong preference for the bottom-left position.

4. Age seemed to strongly influence the probability of occurence of PRS Ss. While about one-third of Ss, 66 months of age and above were PRS Ss, over 50% of those Ss, 65 months of age and below, showed significant sets. With linear arrays, while the PRS Ss in both age groups tended to avoid the fourth position and favor the third position, the younger children seemed to also prefer the second position. With quadrant arrays, both age groups, with the exception of the older females, show the top-left position avoidance, but the older Ss showed a strong preference for the lower-right position, while the younger female Ss showed a strong preference for the bottom-left position. The younger males showed a preference for the top-right position.

5. By utilizing a procedure in which Ss were given training in scanning arrays similar in pattern to the test arrays, guessing patterns were significantly altered in relation to patterns of groups not similarly trained. By training Ss to scan arrays properly, i.e., to look at each position, and by showing them that a correct answer could occur in any of the four positions, substantial change in behavior occured.

6. The training procedures adopted in this research, which succeeded in changing choice patterns in regard to the Chinese Letter Naming Task, also succeeded in transferring the benefit to a situation utilizing the same array patterns, but different stimuli (flags).

RECOMMENDATIONS

1. Further research should be undertaken with respect to the following related problems:

a.) To determine the generality of the findings regarding the degree and pattern of positional response set behavior with children of other background and SES characteristics.

b.) To determine whether PRS behavior is a function of scanning, PRS Ss should be examined as to eye movement patterns in relation to eye movement patterns of good scanners.

c.) To develop methods to produce more extensive changes in test-related scanning skills.

d.) To determine the extent and pattern of positional response sets with other array arrangements and sizes.

2. The results of our investigation imply that positional sets are very common among low SES, preschool-age children. Since this behavior may reflect the lack of adequate scanning by these children, these findings have important implications for preschool programs, especially in reference to prereading skills and test-taking skills. It is possible that low scores on tests by these children, when such tests involve multiple choice, may reflect not so much a cognitive deficit, but, rather, an inadequate registration of the choices offered. If a child is not adequately registering information appearing on a page, then reading cannot take place. Perception must precede cognition.

3. Given the problem outlined above, remedial steps can be taken and should be incorporated into preschool curricula. A step in this direction could be more extensive use or some adaptation of the training methods utilized in the current study. The method has the advantage of training the children to look at all of the choices in a manner which reinforces the correct scanning patterns for reading in the English language, that is, from left to right. It should be pointed out that our training did not produce a strong enough change insofar as changes in number of PRS Ss. However, distributed practice over a longer period of time could produce the desired change. After all, our training period entailed only one, ten minute session.

4. Test users and constructers should be aware of PRS. One technique used by this investigator in the Early Childhood Inventories (Coller and Victor, 1967), is to utilize a second form of a test in which the same choices are given, but their positions changed. If a child is correct on both, we can be reasonably sure that the answer is known. This procedure is desirable for diagnostic testing. Other procedures might utilize some instructional procedures to emphasize to the children the need for looking at all choices. A sliding window technique, for example, could be used for sample items prior to the test.

REFERENCES

Coller, A and Victor, J. Early Childhood Inventories Project (ECIP). Institute for Developmental Studies, 1967 (mimeo).

Cronbach, L. J. Response sets and test validity. Educational and and Psychological Measurement, 1946, 6, 475-494.

Victor, J. An exploration of positional response sets in disadvantaged children and a technique for the reduction of such sets. Office of Economic Opportunity, Progress Report No. 1, New York: Institute for Developmental Studies, 1968 (mimeo).

APPENDIX

A. CHINESE LETTERS - Linear Array

B. CHINESE LETTERS - Quadrant Array

C. TRAINING FIGURES - Linear Array

D. TRAINING FIGURES - Quadrant Array

E. CONTROL FIGURES - Linear and Quadrant Arrays

F. FLAGS - Linear Array

G. FLAGS - Quadrant Array

H. Answer Sheet

I. SLIDING WINDOW - Linear Array

J. SLIDING WINDOW - Quadrant Array